

March 7, 2006

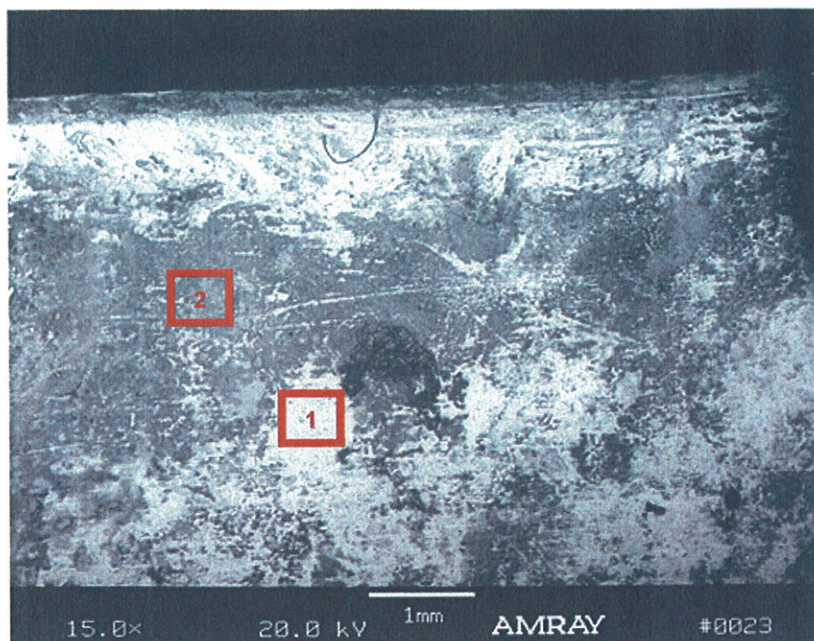


Figure 28. Backscattered electron image of Joint Section 4. EDS spectra from the areas denoted by boxes 1 and 2 are shown in Figure 29 and Figure 30.

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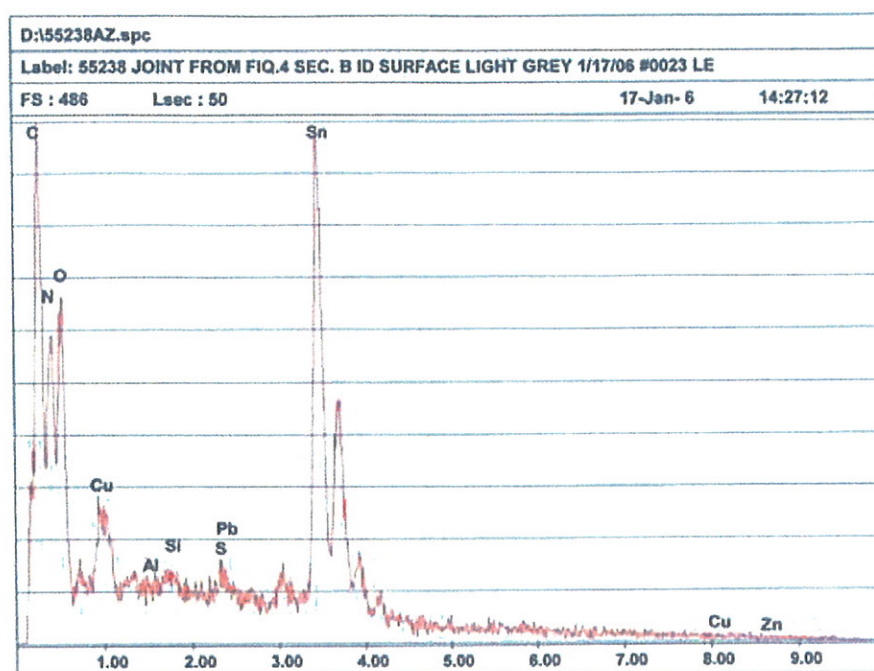


Figure 29. EDS spectra acquired from the region denoted by red box #1 shown in Figure 28.

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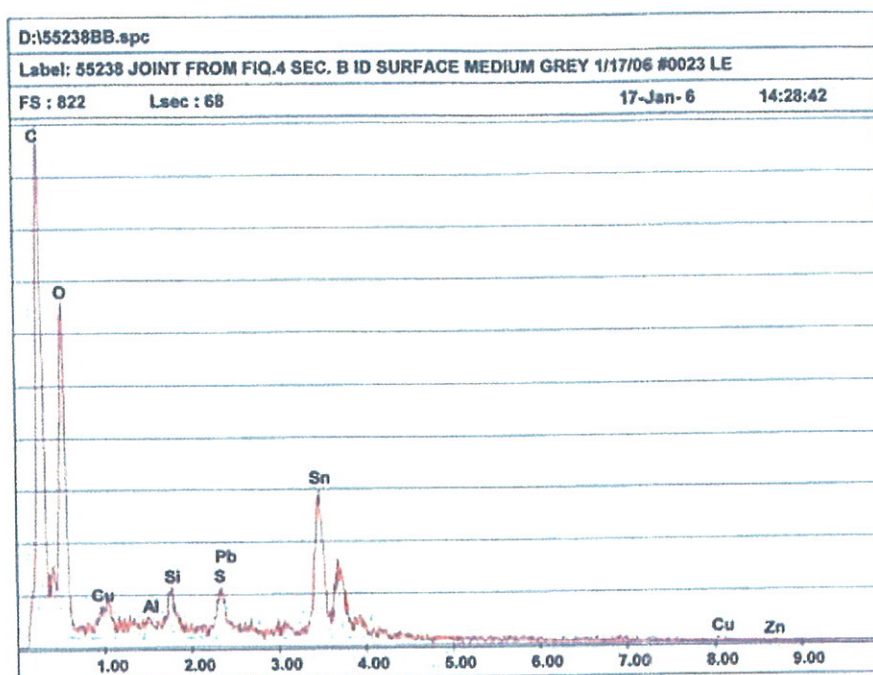


Figure 30. EDS spectra acquired from the region denoted by red box #2 shown in Figure 28.

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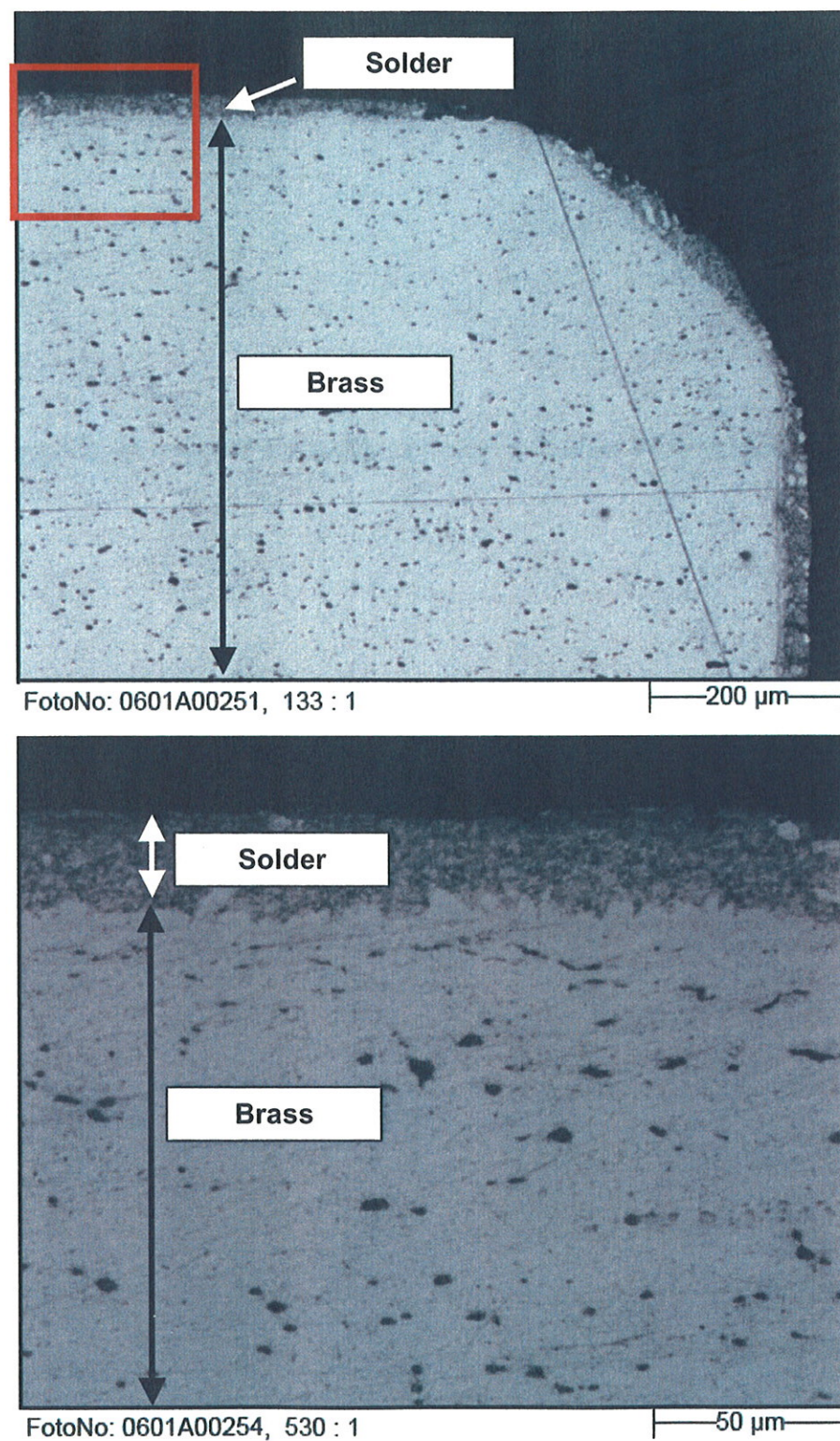


Figure 31. Optical photomicrographs showing the cross-section of the brass fitting, Joint Section 4.

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Discussion

The key results from the analyses presented in the previous section can be summarized as follows:

1. Both joints that separated were comprised of a copper tube soldered to a leaded-brass fitting.
2. The solder was a lead-free, tin-based alloy with a small amount of copper, which is consistent with the type of solder that Mr. Kemp claims to have used.
3. A thick deposit of solder was present on the copper tubes, whereas there was significantly less solder residue on the corresponding brass fittings.
4. Lead was detected in the solder deposit on the outer surface of the copper tubes and the inner surface of the brass fittings.
5. A ridge of solder on one of the copper tubes showed no evidence of melting.
6. One of the separated joints was part of a threaded compression fitting attached to a flexible hose. This fitting could easily have been removed by simply unscrewing the threads.

As mentioned in the introduction of this report, it is apparent that two conditions must be met to separate a soldered joint. First, the joint must be heated to a temperature sufficient to melt the solder. Second, a force must be applied to the joint to parallel to the pipe axis such that the opposing joint sections are pulled away from each other.

In the case where a plumber used a torch to supply the heat, the torch would have been directed onto the fitting until the solder reached its melting point. The joints would then have been pulled apart and the plumber would likely remove the excess solder from the copper tube using a wet towel or rag while the solder was molten. It is important to remove the excess molten solder so that the joint can be soldered again in the future. The plumber will typically remove the excess solder from the separated joint while the solder